Chlorine Validation Session Summary

AGENDA

Wednesday, September 13, 1:30 p.m. – 3:00 p.m.
Room 2503
Aura Validation : Chlorine Subgroup Session

Session chair: Lucien Froidevaux (lucien@mls.jpl.nasa.gov)

1:30 - 1:35	Introduction	
1:35 - 1:50	Global Measurements of Stratospheric Chlorine Dioxide from OMI	Thomas Kurosu
1:50 - 1:55	**Discussion:** OMI-related (chlorine) planned validation papers & future needs/plans	
1:55 - 2:10	Validation of the Aura MLS ClO Measurements	Michelle Santee
2:10 - 2:25	HCl from EOS MLS on Aura: version 1.5 and preliminary version 2 data comparisons with satellite, balloon, and aircraft data	Lucien Froidevaux
2:25 - 2:40	HOCl from EOS MLS on Aura: version 1.5 and preliminary version 2 data comparisons with other measurements and models	Lucien Froidevaux
2:40 - 3:00	**Discussion:** MLS-related (chlorine) planned validation papers Future needs/plans Other topics?	

Status of OMI OClO Product (T. Kurosu)

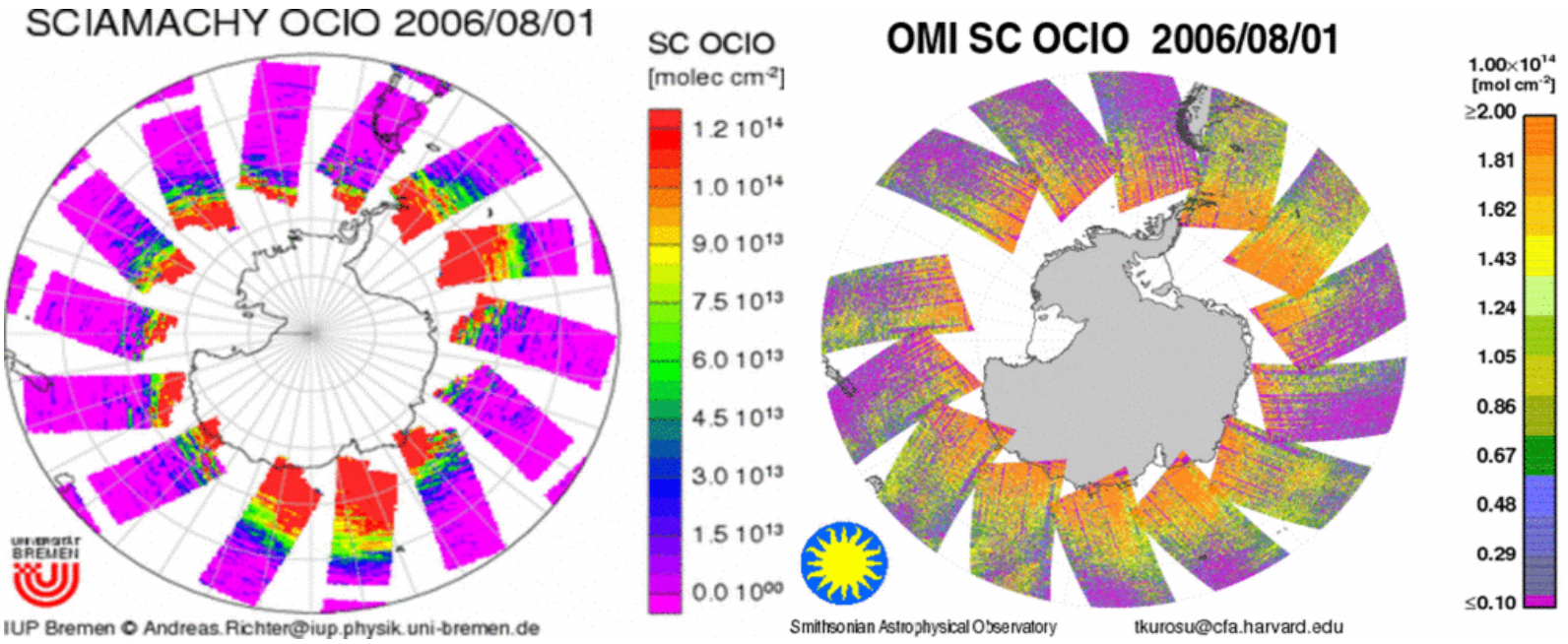
OClO OMI data are provisionally released. Public release in October 2006.

- Current version: v0.9.50 (reprocessing is at ~1 July 2006)

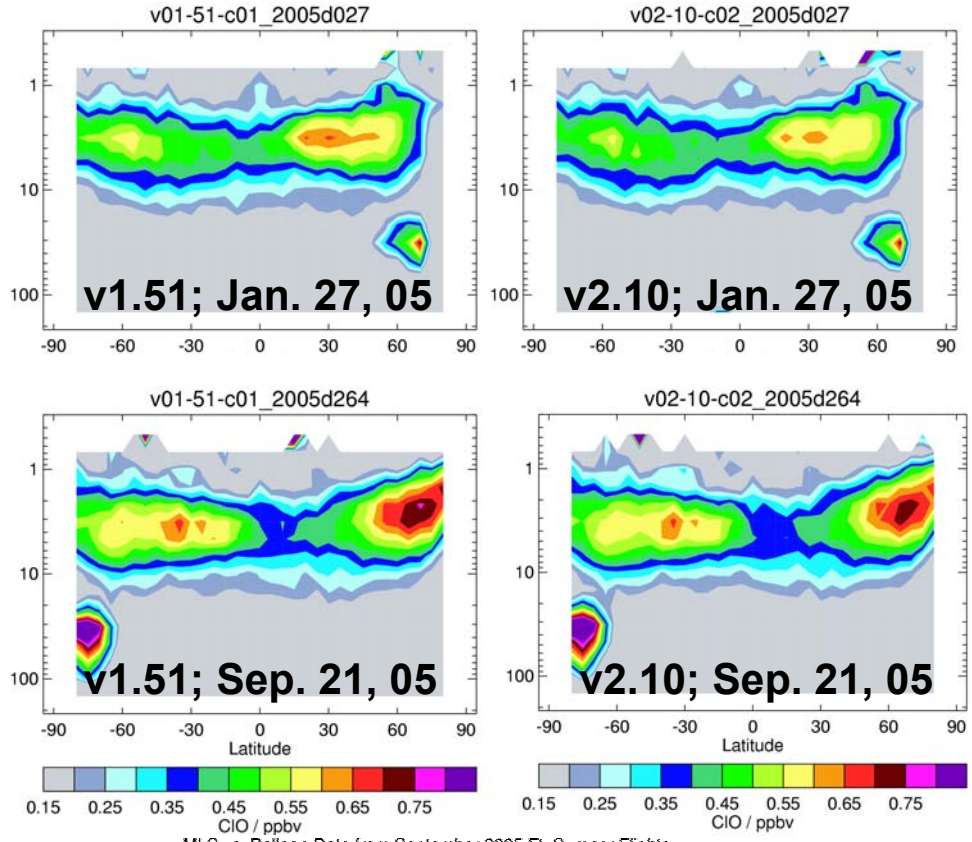
First comparison of current version with SCIAMACHY is encouraging

- **Morphology of OClO in vortex is similar**
- **OMI slant columns > SCIAMACHY slant columns**
  - Fitting uncertainties: ~1x10^{14} mol/cm^2 inside the vortex, ~0.4x10^{14} mol/cm^2 outside

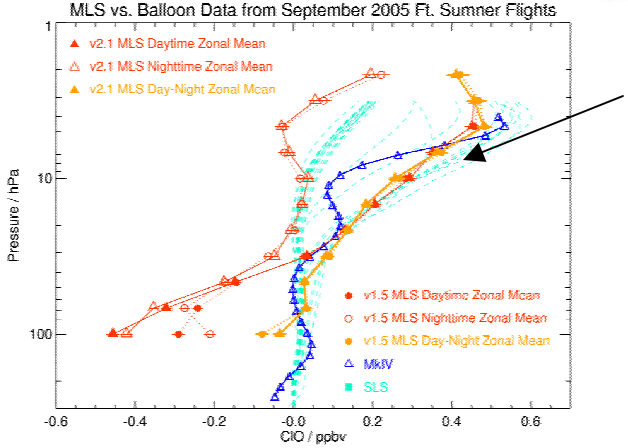
The VERY limited datasets (grd-based, balloon) for validation will be looked into.



Validation of MLS ClO (M. Santee)



- **v2.1 MLS ClO similar to v1.5**
- **Useful range: 100 to 1 hPa** but…
  - Profiles slightly noisier
  - Artifacts: pervasive negative bias of 0.4–0.5 ppbv in both day and night profiles below P~32 hPa; largely eliminated by taking day-night diffs. Somewhat worse than v1.5.
- **Significant ClO changes are not expected for upcoming v2.2.**

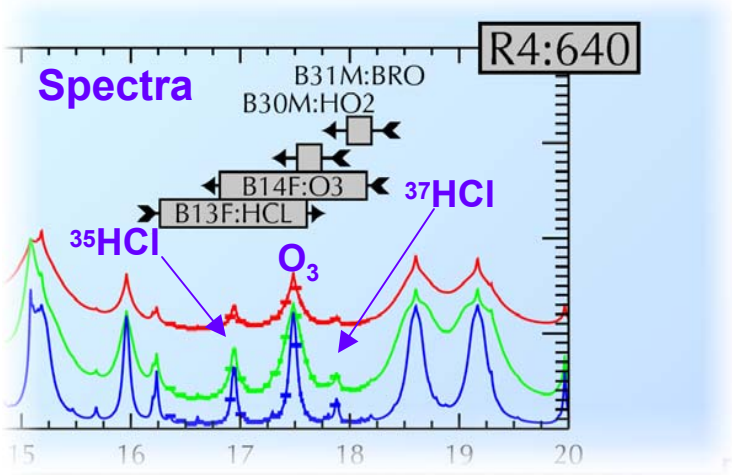


- **MLS/balloon comparison** (Sep. 2005, Ft. Sumner) good, except for caveat above (day–night needed)
- **Other global comparisons** (UMLS climatology, Odin/SMR) from 17 days of v2.1 data show good agreement except for this LS negative bias in MLS.

- **Validation paper planned**
- **Kiruna balloon flight (high ClO) should be useful**

Validation of MLS HCl (L. Froidevaux)

- **Changes from version 1.51**
  - B13 off since Feb. 16 (degradation in counts)
  - HCl now comes from adjacent band (B14) covering most of ^{35}HCl line and isotopic ^{37}HCl line → v1.52 has small systematic difference (a few % in upper strat.) vs v1.51 + somewhat poorer precision (by ~30%) and vertical resolution

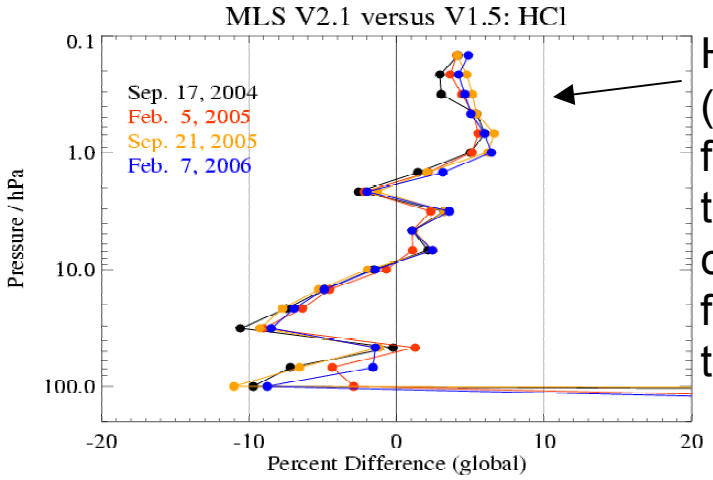


- **Version 2.1 has some other changes**
  - Spectroscopy: small linewidth changes to some O_3 lines [near HCl line]
  - Changes in treatment of retrievals for temperature and tangent pressure
  - Changes in vertical smoothing constraint → better (~ 4 km) vertical resolution in upper stratosphere (but noisier); lower strat. ~ as before.

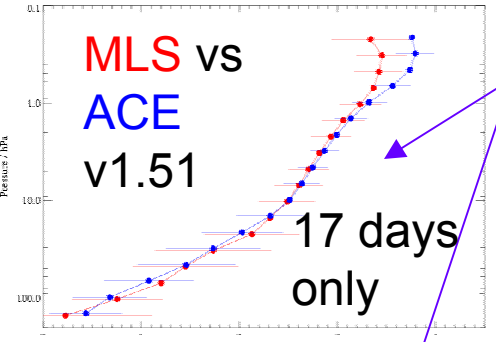
- **Changes in the retrieved standard HCl product (v2.1 versus v1.51)**
  - Precision (& observed scatter) are degraded [by ~factor of 2 in upper strat.]
  - Systematic changes: < ~5% for upper strat., ~10 % for lower strat.
  - MLS HCl at 147 hPa still not deemed reliable (e.g., negative biases)

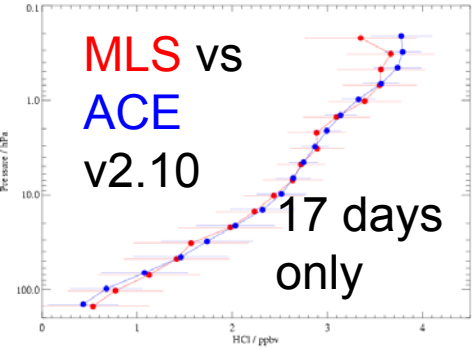
- **v2.2 HCl is not expected to change much from v2.1 (compared to above)**

Validation of MLS HCl (L. Froidevaux)



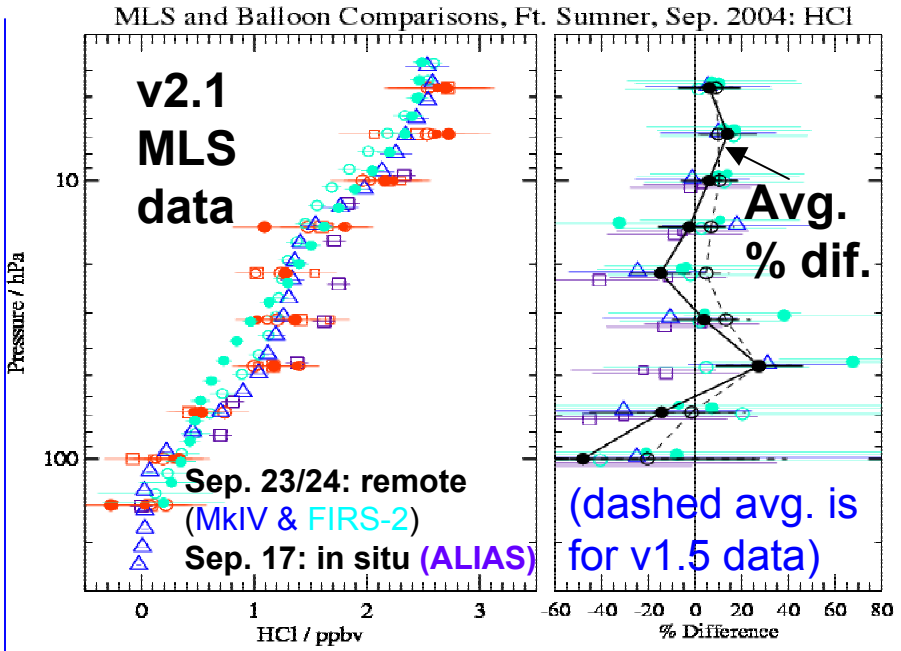
HCl diffs. (global avg) from v1.51 to v2.1 are consistent from day to day





MLS/ACE comparisons

- Now seem to obtain better agreement with ACE profiles in lower mes. (up to 0.3 hPa)
- More days/statistics will give more robust results + can check differences vs latitude
- MLS v2.1 still 10-15% high versus HALOE (was shown in breakout session)



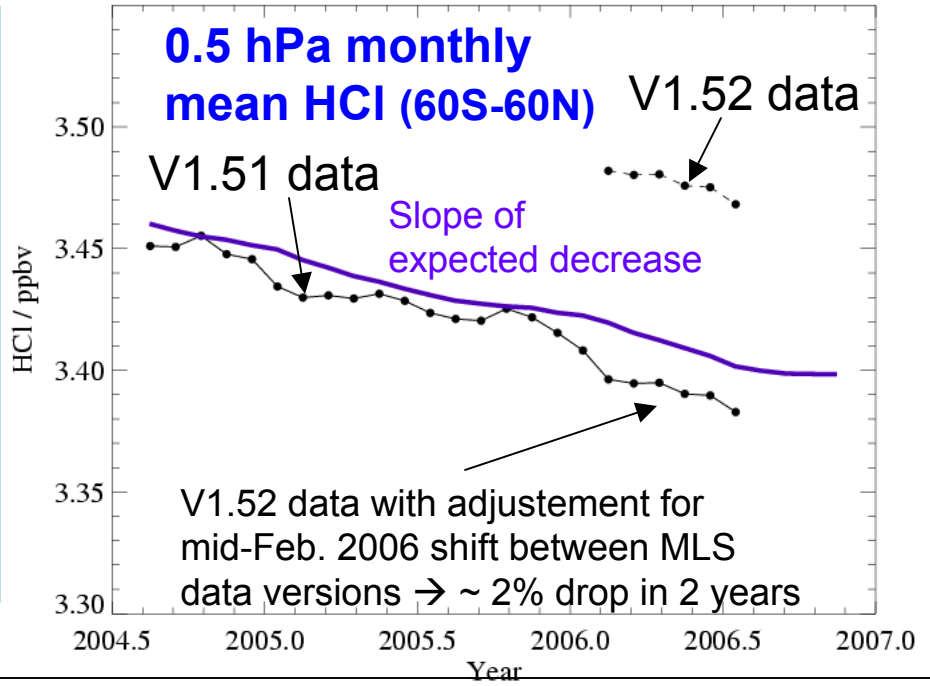
- Ft. Sumner balloon HCl versus MLS HCl for 2004 shows agreement to within 10 -15% with v2.1 data for 32 to 4.6 hPa, and larger variations at higher pressures.
- Preliminary comparisons were also shown/done for Sep. 2005 (still needs some work, but looks reasonably good)

Validation of MLS HCl (L. Froidevaux)

- Can add V1.52 monthly means cautiously to pre-Feb. 2006 data, after adjustment for small (but non-negligible vs yearly decrease) shifts between v1.51 and v1.52 data.

- Global decrease in HCl (Cl_{TOT}) continues.

- **Note: Will need to reprocess the whole MLS mission (since Aug. 2004) to get best/consistent time series for analyses across Feb. 2006 time period.**



Discussion/planning topics

> Validation HCl paper planned for JGR special issue

> Validation needs?

- Campaigns: check winter balloon data (Kiruna 2007) for different conditions in the (depleted LS HCl), although 'one snapshot' may not provide a stringent constraint

> Longer-term planning (mostly)

- Continue to look at MLS upper stratospheric data versus expected decreases
- Continue consistency checks between MLS & ACE-FTS + more balloon data (08, 09?)
- Add comparisons to column FTIR data ($HCl+ClONO_2$) [for > 2-3 yrs of MLS V2 data] and possibly check versus ground-based microwave ClO data

Validation of MLS HOCl (L. Froidevaux)

- **Summary: HOCl data and comparisons require more work**
  - Changes in new MLS data (v2.1) yield a decrease (~ 10-40%) in upper stratospheric HOCl
  - Can cautiously use MLS HOCl data (V1.5 and V2) for continued evaluations at pressures from 10 hPa to 2 hPa (revised vertical range).
  - Note: MLS HOCl requires ~ 15 days of zonal means (10° or 20°-wide bins) for < ~10 pptv precision

  - MLS day and night HOCl data (averages) show qualitative similarities with balloon data and with models
    > night profiles peak at higher altitude
    > smaller daytime abundances than at night

  - MLS HOCl values are lower (by ~ 30-50%) than FIRS-2 data (and seem lower than MIPAS data).

  - However, more work is needed on local time matching or corrections (diurnal effects are important) for all the profiles obtained (SLS, MkIV, FIRS-2) + need model studies *(see L. Kovalenko poster).*

  - Uncertainties in rate of formation for HOCl affect the model results significantly
    > the lower k (ClO+HO2) values (recommended, JPL 2006) appear to agree better with HOCl from MLS than with FIRS-2 (PSS model from Kovalenko/Salawitch… and also simple daytime equilibrium model constrained with MLS data)

  - Need to also keep working on sorting out / explaining differences in the various balloon measurements; some differences may be local time issues (some may not be).

  - Main MLS issue: improve the lower stratospheric MLS HOCl data quality
    > However, this has lower priority than other potential improvements for MLS

- **Validation paper?**
  Probably better after MLS product improves, e.g., possibly via retrievals on radiance averages.